LIGHT SCATTERING STUDIES ON HIGH POLYMER SOLUTIONS

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Introduction

Polyelectrolytes have been the subject of several recent investigations because of their unusual properties in solution. Many of these properties can be attributed directly to the magnitude of the molecular charge. For example, the large increase observed in the intrinsic viscosity of these polymers during neutralization and dilution is attributed to an expansion of the electrolyte molecule caused by the large charges which are induced on the molecule. In addition, evidence presented by numerous investigators (1) (2) (3) (4) (5) revealed the ability of the polymer anions to absorb cations and inactivate them.

The properties of these polyelectrolytes have been studied mainly by the use of viscosity, emf, conductivity, osmotic pressure, transference number, and pH experiments. It was thought that a study of these polyelectrolytes, using polyacrylic as a representative model, by light scattering methods would yield valuable information on their properties and particularly on the factors which effect the molecular dimenisons.

The recent advances in the theory of light scattering made by Debye (6) conveniently permits the measurement of weight average molecular weight and average size of solute particles. The Debye equation for high polymer solutions can be expressed in the following form,

$$H(c/t) = 1/M + 2Bc + 3Dc^2$$

where H is a constant which can be evaluated from a knowledge of the wave length of light used and the refractive index of solvent and solution, c is the concentration of solute, M is the weight average molecular weight, t is the turbidity of the solution, and B and D are constants.

VITA

The author was born in Jeannette, Pennsylvania, on February 11, 1922 and attended the primary and secondary schools of Erie, Pennsylvania. He graduated from high school in 1940 and in the same year enrolled in the University of Pittsburgh on a Honor Scholarship. In 1943, he was granted a Bacehlor of Science with Honors in Chemistry. Following this, he was employed by the Illinois State Geological Survey for research on metallurgical coke until January 1946 at which time he transferred to the Graduate College of the University of Illinois. Here he held a Special Research Assistantship in Chemistry on the U. S. Government Rubber Research Program. The author is a member of the American Chemical Society, Sigma Pi Sigma, Sigma Xi, Phi Lambda Upsilon, and Pi Mu Epsilon.

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